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the policy above outlined will result in a body of trained students, ready for expert work, many of whom will undoubtedly enter the government service, while others will become instructors in institutions of learning or be engaged as experts in private capacity. This will avoid competition with other institutions, will give most valuable training and practical experience to students, and will be especially helpful to instructors in educational institutions, who might wisely be sent for six months or a year to Washington, as at present some are sent abroad. There should be no thought of providing a general or liberal course of education. Coming as student assistants, there should be opportunities and encouragement only on clearly defined lines of study and investigation. There are many large and small problems to be worked out by the officers of the Washington Memorial Institution, but with the skilled educator and organizer now at its head as director their successful solution is only a matter of time. It is anticipated that the Washington Memorial Institution will, under the direction of Dr. Gilman, begin its work by November 1, 1901.

The Government's part in the work, when once under successful headway, will be to enlarge the quarters of the various bureaus concerned. This will be necessary eventually even if no student assistants are provided for. The Government has done its part nobly so far. It is now for the educational institutions of the country to come forward and assist by setting a high standard of scholarship for admission to the privilege of becoming a student assistant in the Government bureaus. Only students of the type of those who win fellowships or excel in ability should be certified or accepted.

The Washington Memorial Institution should, and I believe will, maintain a standard that will meet the approval of our

colleges and universities. It should occupy a most important place in the great educational work of the country. With the hearty cooperation of our collegiate institutions and of the officers of the Government, there is little question that it will ultimately become the federated head and clearing-house of all the higher educational interests of the country.

The relations of the National Government to higher education and research are intimate and complex; but the complexities are already partially resolved, the present is auspicious, and the future outlook is most promising. Long ago the nation recognized its obligation 'to promote a higher and more extended policy than is embraced in the protection of the temporal interests and political rights of the individual.' The action of Congress in the present year in opening the Government bureaus at Washington for study and research is a long stride forward, and, if carried out in good faith must result in another and higher standard for American endeavor.

CHARLES D. WALCOTT.

U. S. GEOLOGICAL SURVEY.

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*THE ROYAL SOCIETY OF CANADA.*

THE twentieth general meeting of the Royal Society of Canada was held in Ottawa, May 21, 22 and 23, 1901. This is essentially a national institution. It was founded in 1882 by the Marquis of Lorne, now His Grace the Duke of Argyll. The Society is divided into *four* sections:

- I. French Literature, History and allied subjects.
- II. English Literature, History and allied subjects.
- III. Mathematical, Physical and Chemical Sciences.
- IV. Geological and Biological Sciences.

The Society met this year under the presidency of Dr. Louis Honoré Fréchet, C.M.G., who delivered his inaugural address, 'Race and Language Problem in

Canada,' on the evening of Tuesday, May 21, before a large audience. The various sections met for the transaction of business and reading of papers. Delegates from affiliated literary, scientific and historical societies throughout Canada presented their reports and many of them took part in the deliberations of the Society.

The report of Council for 1901, presented by the Honorary Secretary, Sir John George Bourinot, K.C.M.G., historian, besides containing an account of the business affairs of the Society regarding the election of four new fellows, the diplomas of fellowship, the death of the Queen and the accession of King Edward VII., the associated societies and the proposed meeting in Toronto in 1902, dealt a heavy blow upon the circulation of 'yellow' journals of the United States and in general. The question of establishing public libraries, the care of the Dominion archives, the Canadian Marine Biological Station, Nova Scotian and New Brunswick archives, tidal investigations, together with the question of publishing historical memoirs and diaries received attention as well as the question of preservation of places of scenic and historic interest, including the site of Louisbourg and the Plains of Abraham. The report also contained biographical sketches of the late fellows, Hon. F. X. Marchand and Dr. George Mercer Dawson.

In accordance with a suggestion contained in the honorary secretary's report of last year, to prepare a record of Canadian publications embraced under the several sections of the Royal Society, the following committee of Section IV., which was appointed in May, 1900, reported, viz: For geology and paleontology, Dr. H. M. Ami; for general zoology, exclusive of entomology, Dr. J. F. Whiteaves; entomology, Dr. C. J. S. Bethune; botany, Dr. A. H. Mackay. By a resolution of the Section the same committee was reappointed for the year 1901.

Inasmuch as Sections I. and II. are literary and historical and Sections III. and IV. deal with the *sciences* mathematical, physical, chemical and natural, the following abstracts of papers read before the last two named sections will be given for the benefit of the readers of SCIENCE:

SECTION III.—MATHEMATICAL, PHYSICAL  
AND CHEMICAL SCIENCES.

Presidential Address: *A Century of Progress in Acoustics*: PRESIDENT LOUDON, of the University of Toronto.

*The Principles at the Base of Quaternion Analysis*: Professor ALFRED BAKER, M.A., of the University of Toronto.

*Note on the Basic Chlorides of Lead, Antimony and Copper*: Professor W. LASH MILLER, PH.D., of the University of Toronto, and Mr. F. B. KENRICK, PH.D.

A method of ascertaining whether the precipitate produced in a salt solution by potash or ammonia is a single chemical compound, a mixture, or a 'solid solution,' with results of experiments.

*The Synchronism of Arctic and Antarctic Auroræ*: Mr. ARTHUR HARVEY.

Auroral observations of the Belgian Antarctic expedition of 1898. Construction of a table and an auroral curve therefrom; identification of this curve with those for Canada and the United States. Enquiry from Arctowski, meteorologist of the *Belgica*, if other concordances are traceable between Auroræ Australes and Boreales. He entrusts the examination to Canada. Detailed scrutiny of the records of these countries shows the distribution of auroræ to be local and that their character varies at various points. Negative answers must be returned to the questions asked, but close examinations of auroræ in Canada must be made during the several Antarctic expeditions soon to set out.

*The Human Machine, the Most Marvelous (as set forth by Dr. Lardner in his Animal Physics, 40 years ago):* MR. C. BAILLARGÉ, C.E., M.A.

*On the Occurrence of Free Ammonia in Saline Waters:* FRANK T. SHUTT, M.A., F.I.C., F.C.S.

*The New Gas from Radium:* Professor E. RUTHERFORD B.A. (Cantab.), of McGill University, and Miss H. T. BROOKS.

*Discharge of Electricity from Glowing Bodies:* Professor E. RUTHERFORD, of McGill University.

#### SECTION IV.—GEOLOGICAL AND BIOLOGICAL SCIENCES.

*Observations on Phenological Records:* Presidential Address before the Section by Dr. A. H. MACKAY, Superintendent of Education in Nova Scotia.

In this paper Dr. MacKay referred to the different stations established in Nova Scotia and other portions of Canada where phenological observations were being recorded. The records of the average phænon of certain well-known species of flowering plants were also discussed, and the best methods of eliminating errors in records.

*Sir John W. Dawson—In Memoriam:* Professor FRANK D. ADAMS, M.E., Ph.D., (by request of the Royal Society at its meeting in 1900).

This memorial of the first president of the Royal Society of Canada was read by title and ordered to be printed *in extenso* together with Dr. Ami's completed 'List of Writings of Sir William Dawson.'

*The Carboniferous Basin in New Brunswick:* R. W. ELLS, LL.D., of the Geological Survey of Canada.

The Carboniferous rocks in New Brunswick embrace an area of not far from 12,000 square miles. They occur in a roughly triangular-shaped basin, which extends from the Gulf of St. Lawrence on the east as a

base, nearly to the southwest boundary of the province. At a number of points beds of coal are found, but these, in so far as yet examined, are thin, ranging from a very few inches to about two feet in thickness. Borings have been made from time to time for over sixty years to ascertain the presence of thicker or more workable beds, but owing to various causes such attempts have not yet been successful. The greater portion of the area, however, has not yet been proved. The paper will briefly state some of the principal conclusions arrived at regarding the structure of this basin during the last thirty years, and will indicate the relations of the Carboniferous sediments to the rocks of the underlying formations. In the discussion which followed, Dr. Bailey pointed out that the Legislature of New Brunswick had granted a subsidy for the purpose of developing the coal-bearing areas of the Grand Lake District. Dr. Matthew maintained that there was considerable chance of discovering suitable coal seams in New Brunswick, and argued that something should be done to ascertain their possible existence. Dr. Ami stated that within the Carboniferous Basin of New Brunswick he would include the strata called 'fern-ledges,' Lancaster formation or 'Little River Group,' which held a flora and fauna of Carboniferous age.

*Notes on Some of the Silurian and Devonian Formations of Eastern Canada, and their Faunas and Floras:* H. M. AMI, M.A., D.Sc., F.G.S.

From recent studies carried on by the author, the succession of the sedimentary formations of both the Silurian and the Devonian Systems in Eastern Canada needs revision and elucidation. There are several distinct geological horizons which constitute as many distinct formations that are as yet unplaced and unnamed in the Canadian succession, and a discussion of the relations which exist between the different

formations or members of these systems in different portions of Canada was presented. The subdivision of the Silurian succession at Arisaig, in Antigonish County, Nova Scotia, those of Gaspé, Anticosti and Ontario are included, and are based upon the faunas determined by the late Mr. Billings and Professor Hall, as well as from material in the hands of the author for some years past. The subdivisions of typical Devonian formations are also given. These will form a basis for the classification of the terranes in eastern Canada, according to latest and most approved methods.

*Acrothyra and Hyolithes—a comparison. With a description of a new species of Hyolithes*: G. F. MATTHEW, LL.D.

The comparison was made for the purpose of seeing how far the muscular system of one genus corresponds to that of the other. The ventral valve of *Acrothyra* was compared with the tube of *Hyolithes*, and the dorsal valve of the former genus with the operculum of the latter. The *Hyolithes* described is a slender species from the base of the *Paradoxides* bed at St. John.

*On some Modes of Occurrence of the Mineral Albertite*: Professor L. W. BAILEY, LL.D., of New Brunswick University.

Since the closing of the celebrated Albert Mines, in Albert county, New Brunswick, the ownership of which for a time hinged upon the determination of whether the mineral which thence derived its name should be regarded as coal or asphalt—a number of interesting observations have been accumulating which have a direct bearing upon this question. The present paper narrates and discusses some of these observations, and is accompanied by specimens illustrating the occurrence of the mineral with widely different associations, and in rocks of quite different geological horizons, *e. g.*, in Pre-Cambrian slates, in calcareo-bituminous shales, in gray Car-

boniferous sandstones, in snow alabaster, in admixtures of calcite and pyrite, and cementing crystals of selenite. The vein-like nature of the mineral and its originally fluid or semi-fluid condition are strongly emphasized. In the discussion which followed, Dr. Ells, Dr. Ami and Mr. Poole took part. Dr. Ells places the Albert shales in the Devonian System. Dr. Ami argued for the Eo-Carboniferous age as shown by fish remains and plants.

*Jacques-Philippe Cornuti. Notes pour servir à l'histoire des sciences au Canada*: Par MGR. LAFLAMME.

Cornuti a publié à Paris, en 1635, un volume qui renferme la description d'un bon nombre de plantes canadiennes. Il n'est jamais venu au Canada; ses études ont été faites d'après des échantillons vivants dans le jardin des Robins, à Paris. Le but de cette note est d'abord de rechercher par qui les plantes canadiennes avaient été transportées à Paris, si tôt après la fondation de Québec, et ensuite, d'examiner toutes ces descriptions et de déterminer la synonymie entre la nomenclature de Cornuti et la nomenclature actuelle.

*On some Geological Correlations in New Brunswick*: Professor BAILEY, LL.D., of New Brunswick University.

While the geological age of the rock formations in New Brunswick has in most instances been determined upon satisfactory evidence, much uncertainty has existed regarding certain groups of strata and especially those which, consisting largely of slaty rocks, border the great central granite axis which traverses the central part of the province, in the counties of York, Carleton, Northumberland and Gloucester. For, though regarded originally as Cambrian by Gesner, Robb, Logan, Hind and others, and subsequently colored and described, though only provisionally in the maps and reports of the Geological Survey, as Cambro-

Silurian, the only fossils found therein, at widely separated points, were, with a single exception, where an Ordovician fauna occurs, such as to indicate a much more recent (Silurian or Devonian) horizon. In the investigation of the problems arising from this fact, and in the effort to determine, upon behalf of the Geological Survey, more exact knowledge as to what systems were actually present and their relative limits, the author of this paper was, during the past summer, fortunate in being able to obtain evidence in the discovery of certain graptolitic strata, tending to confirm the original view that large portions of the belts in question are really of Cambrian age, with a probability that other large areas are still older, representing either the Etcheminian formation, so called, of Matthew or the Huronian of other writers. The facts relating to these observations, which have a bearing upon questions of a far-reaching character in relation to Acadian geology, are in this paper briefly summarized and discussed.

*On the Subdivisions of the Cambrian System in Canada:* H. M. AMI, M.A., D.Sc., F.G.S., of the Geological Survey of Canada.

This paper discusses the various geological formations which naturally fall under the Cambrian system in British North America. An attempt is made to present a systematic table giving the succession of the different faunas of this system and the different formations under which each falls. The main object of this paper is to bring the nomenclature of this system to date with a view of classifying the organic remains comprised within its limits, with a brief discussion as to these limits.

*A Backward Step in Paleobotany:* G. F. MATTHEW, LL.D.

This is a review of the attempt made to claim the plant beds in the Little River Group and their flora, and so the whole

terrane, as Carboniferous. This claim is made on Paleobotanical grounds by Messrs. D. White, R. Kidston and H. M. Ami.

The article recites the stratigraphical and physical objections to this view, and in this connection two sections near St. John are given, showing the relation of this terrane to the lower Carboniferous. The fauna of the plant beds is reviewed, and it is suggested that even from this point of view there is not sufficient evidence to overthrow the result arrived at by those who had previously studied the flora and the stratigraphy. Dr. Bailey, Dr. Ells, Mr. H. S. Poole and Dr. Ami took part in the discussion which followed the reading of this paper. The first three gentlemen brought forth all the arguments possible bearing on the Devonian age of the plant beds in question. Dr. Ami pointed out the synchronism existing between these beds and the Carboniferous strata of other parts of North America and Europe.

*Notes on Some Butterflies from Western Canada:* Dr. JAMES FLETCHER, Dominion Entomologist.

This paper described interesting captures made in the northwest Territories and the Rocky Mountain region of Canada.

*The Avifauna of the Province of Quebec:* Sir JAMES M. LEMOINE, Knt. F.R.S.C.

This forms an interesting check-list of the birds of the Province of Quebec.

*A Dual Classification required in the Nomenclature of the Geological Formations in Different Systems in Canada:* H. M. AMI, of the Geological Survey of Canada.

This paper brings forward the result of special work carried on by the writer during the past fifteen years in the classification of numerous geological formations throughout the Paleozoic Period in Eastern Canada. It has become necessary, in the light of recent investigation, to introduce two parallel columns at least, in the suc-

cession of the geological formations of Ordovician, Silurian, Devonian and even Carboniferous Systems. Tables giving the natural order of succession of the different formations falling under this dual classification accompany the paper.

*The Value of Nature Study in Practical Education:* Dr. JAMES FLETCHER, Dominion Entomologist to the Central Experimental Station at Ottawa.

In his opening remarks Dr. Fletcher said that he was thankful that the educators of the youth in every province of Canada have shown that they keenly appreciate the value of natural history studies as an integral and effective part of a practical education. He would appeal more especially, now, to the educated classes of Canada, amongst whom it must be acknowledged there is an appalling and unnecessary ignorance upon many useful branches of knowledge, some information upon which would make them far better citizens and more efficient competitors in whatever branch of work they may have adopted as the means of obtaining a livelihood. There is no profession, trade or occupation, in which definite or exact knowledge is not daily required with regard to subjects, the consideration of which comes within the scope of some branch of natural science. The last half-decade has seen a bright awakening to the realization of the value of nature studies as a means of cultivating the faculties of the youth of every land where progress is made. To teach the child the beginnings of things, the elements of knowledge through the common things about us, will lead it to want to see, to know and understand, and hence think carefully with a view of drawing right conclusions. The flowers, birds and insects furnish as many and useful objects for the grandest, the simplest and best lessons in educating the youth of our land. Whether they are beneficial or injurious, and why so, will

lead the observing student to find out their uses and recognize whether they have or have not as yet been recognized. Sympathy and kindness are the outcome of nature studies, likewise healthful enjoyment. Principles of perfection appear wherever nature has not been interfered with. A perfect method and system is revealed, and well may those entrusted with the education of others turn to these natural models to inculcate those principles so necessary to develop the mind.

Amongst the interesting exhibits shown during the meetings of the Royal Society was a plan of the new museum, known as the 'Victoria Memorial Museum,' to be erected in Ottawa at once. Through the kindness and courtesy of the Honorable Mr. Tarte, Minister of Public Works, the plans were placed on exhibition in the Normal School building where the Royal Society was holding its meetings. The building has a frontage of 322 feet, and is 188 feet deep, with a tower dome in the center. It is intended to accommodate the collections at present stored in the unsafe building occupied by the Geological Survey Department on Sussex Street, Ottawa, comprising minerals, ores, fossils, plants, trees and other natural history objects as specimens illustrating the natural resources of Canada, also the Fishery exhibit now on O'Connor Street, and the paintings in the Art Gallery. A resolution, passed by the Royal Society of Canada and transmitted to the Government of Canada congratulated the latter on its wise action.

On May 22 a resolution was passed approving and supporting Capt. F. Bernier, of Quebec City, who is taking charge of the expedition to the North Pole. An interesting discussion followed in which many Fellows took part, including G. H. Parkin, C.M.G., Sir Sandford Fleming Dr. R. Bell,

F.R.S. and Capt. Bernier himself. It will be remembered that in 1900 the last-named gentleman described his proposed route of travel after having pointed the courses taken by all the previous important expeditions to the North Pole, including Fridtjof Nansen's important last voyage.

The following officers were elected:

President: Principal J. Loudon, LL.D., of Toronto University, Toronto.

Vice-President: Sir James A. Grant, K.C.M.G., M.D., etc., Ottawa.

Hon. Secretary: Sir John G. Bourinot, K.C.M.G., LL.D.

Hon. Treasurer: Dr. James Fletcher, F.L.S.

The following officers of Section IV. (Geology and Biology) were elected for the ensuing year:

President: Professor Frank D. Adams, M.Sc., Ph.D.

Vice-President: Professor T. Wesley Mills, M.D., etc.

Secretary: Mr. G. U. Hay, Ph.B. (St. John, N.B.).

H. M. AMI.

OTTAWA, May 27, 1901.

#### SCIENCE AND THE LONDON UNIVERSITY.\*

##### I.

By the University of London Act, 1898, and the statutes and regulations framed in pursuance thereof, the long-standing controversy as to the form and organization of the London University was finally disposed of. The various colleges and other institutions doing university work within the metropolitan area have been coordinated under a strong and representative senate, which is charged with the duty of providing, for the six millions of inhabitants within a radius of 30 miles from the University building, every kind of instruction of university type. To enable the reorganized London University to cope with this gigantic task, the Chancellor of the Exchequer frankly

confesses his inability to do more than provide the office expenses. If London wants a teaching university, London, says the Chancellor, must pay for it. In the special financial circumstances of the moment this appeal to public-spirited Londoners can scarcely be considered unreasonable.

The task of equipping and endowing a University can never be a small one, and the extent and variety of the needs of London might daunt the munificence even of an American millionaire. Fortunately, we do not have to start quite from the beginning. The organization and constitutional framework are completed and stand ready to start. A large part of the materials for a University worthy even of the capital of the Empire only await the hand of the master builder. What is wanted is, first, a comprehensive survey of the field and an appreciation of the amount and variety of the work to be done. Upon this must follow the motive power of money.

The new university is organized in eight faculties, namely, theology, arts, music, law, medicine, science, engineering and 'economics and political science (including commerce and industry).' But, though provision is thus made for all branches of University study, old and new, it is already clear that London University will have a character of its own. The distinctive note of the University is evidently destined to be that of applied science, or the concrete application to every branch of industrial and social life of the discoveries and laws of the various sciences. It is this side of university organization that we must therefore first consider.

In physical science the London University holds an honorable tradition, as having been the first to create a science degree. At present the University includes three 'schools' of science for men, and two more (Bedford and Halloway) for women only. Of these, the Royal College of Science, fully

\* From the London *Times*.